Mesoscopic distinct element method-enabled multiscale computational design of carbon nanotube-based composite materials

Completed Technology Project (2016 - 2020)

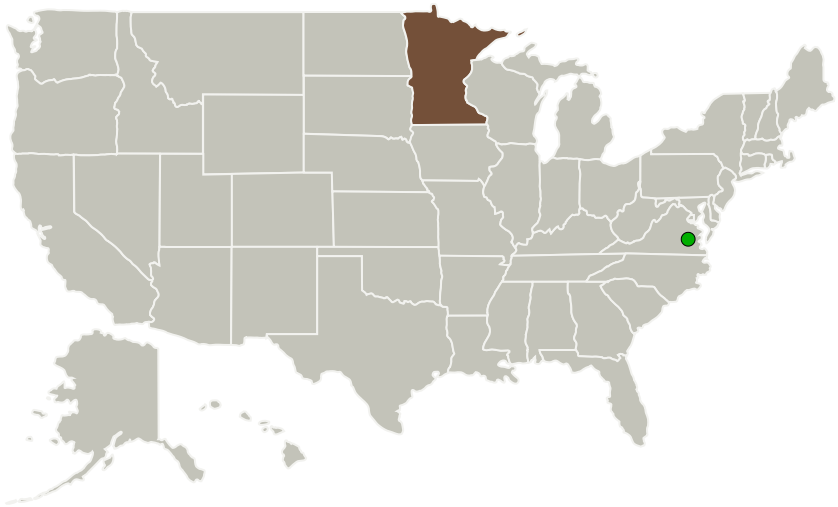
Project Introduction

There is a sustained effort to develop super-lightweight composites by using polymer impregnation of carbon nanotube (CNT) sheets. This promising area is still in its early stages and significant progress is required before CNT-based composites can be used in load bearing aerospace structures. Researchers from the University of Minnesota, Rensselaer Polytechnic Institute, and Skolkovo Institute of Science and Technology in Moscow will develop a broad scope multiscale modeling methodology able to simulate the mechanics of these materials. A mesoscopic distinct element method will allow for simulations of massive fibrous ensembles not only through parallel computing but also through efficient coarse graining of the atomistic scale interactions. This development will accelerate progress by providing the ability to guide experimental design through simulations.

Anticipated Benefits

A mesoscopic distinct element method will allow for simulations of massive fibrous ensembles not only through parallel computing but also through efficient coarse graining of the atomistic scale interactions. This development will accelerate progress by providing the ability to guide experimental design through simulations.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
University of Minnesota-Twin Cities	Lead Organization	Academia Asian American Native American Pacific Islander (AANAPISI)	Minneapolis, Minnesota
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations
Minnesota

Project Website:

https://www.nasa.gov/strg#.VQb6T0jJzyE

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

University of Minnesota-Twin Cities

Responsible Program:

Space Technology Research Grants

Project Management

Program Director:

Claudia M Meyer

Program Manager:

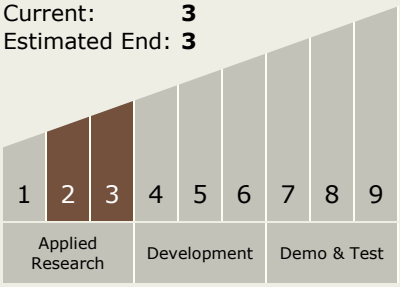
Hung D Nguyen

Principal Investigator:

Traian Dumitrica

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



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Technology Areas

Primary:

- TX11 Software, Modeling, Simulation, and Information Processing
  - TX11.3 Simulation
    - TX11.3.5 Exascale Simulation

Target Destination

Outside the Solar System